PATENT

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Todd R. Carroll
Serial Number:	09/128,721
For:	Composite Chemical Barrier Fabric With Enhanced Durability
Group Art Unit:	1771
Examiner:	John Guarriello
Attorney's Docket No.:	N06310 RSM
Customer No.:	23456

DECLARATION UNDER 37 CFR § 1.132

Commissioner of Patents and Trademarks
Washington, DC 20231

August 22, 2001

Dear Sir:

This Declaration under 37 C.F.R. § 1.132 is submitted in connection with the above-identified application.

1. My name is Todd R. Carroll, and I have reviewed and understand the present Specification and Claims (including the claims submitted in

the accompanying Amendment and Response), and I have reviewed and understand the Office Action mailed May 22, 2001, in connection with the above-identified application.

2. My educational background and relevant work experience is as follows: BSc. Chemical Engineering (Colorado School Of Mines, Golden Colorado); BSc. Engineering Chemistry (Colorado School Of Mines, Golden Colorado); Senior Engineer Research & Development, Kappler Protective Apparel & Fabrics (1993-present); Program Manager, Protective Clothing Division, Texas Research Institute (1992-1993); Consultant, Arthur D. Little, Center For Personal Protection Technology (1986-1992); Chairman, International Safety Equipment Association, Protective Clothing Group; Chairman, American Society For Testing & Materials, F23 on Protective Clothing (Subcommittees F23.30-Chemicals & F23.95-Symposium).

3. I have supervised a comparative experiment designed to compare preferred embodiments of U.S. Patent No. 5,626,947 to Hauer, et al., with the present invention.

4. We evaluated two embodiments of the Hauer patent that are commercially available, designated below as Fabric A and Fabric B.

Fabric A: Tychem 7500, available from DuPont.

Fabric B: Tychem 10,000, available from DuPont.

More specifically, as described by Hauer, Fabric A is a composite comprising a Surlyn® skin on top of a polyester (PET) core, which has been subsequently laminated to a flexible nonwoven substrate.

Swatches of Fabric B were cut from a finished garment, which was manufactured by MarMac (i.e., Serial #406882, mfg. July 12, 1995). Fabric B contains the same Surlyn®/PET outer film composite as Fabric A, however, it is laminated to a high loft nonwoven substrate. A second film composite which contains a layer of the highly chemically resistant polymer ethylene vinyl alcohol (EVOH), is than extrusion laminated to the backside of the Surlyn®/PET/nonwoven composite.

Fabrics C & D were additionally tested and are similar examples of highly chemically resistant, multiple layer limited-used chemical protective fabrics that do not contain Surlyn® or PET. As such Fabrics C and D are not covered by the Hauer patent. Rather, Fabrics C & D are examples of thin, light-weight multi-layer chemical fabrics that contain EVOH, polyethylene, Nylon, and other similar thin film membranes. Fabrics A, B, C, and D all represent light-weight multi-layer chemical fabrics that offer varied degrees of chemical resistance and physical properties.

Fabrics E & F are embodiments of the subject patent and represent enhancements of fabrics C & D through the addition of the TPO durability enhancing coating.

5. Fabrics A – F were tested using an ISO 7854 Method B flex test.

ISO 7854 Method (modified) exposes a small tube of fabric to a high-speed unidirectional flexing motion. Post flex conditions can be evaluated by placing the flexed swatch in a chamber that can be put under either positive or negative pressure.

This test is cited in both European and International test methods such as that being developed by ISO/TC94/SC13 (i.e., ISO/DIS 16602 draft standard entitled; Clothing for protection against chemicals - Classification, labeling and performance requirements.) Under Section 6.14 Flex Crack Resistance, ISO 7854 is used to classify the flex resistance of a chemical protective fabric according to a 6-tiered system as below. The 16602 document, "Type" classifies fabrics and garments based on their expected use and exposure scenario. Scenarios requiring greater field durability would require a fabric exhibiting higher flex crack performance (i.e., Class 4, 5, or 6), while scenarios requiring a lesser degree of durability would require lower flex crack performance (i.e., Class 1, 2, or 3). Materials such as Fabric A would be expected to offer

flex crack resistance in the lower Class 1, 2 or 3 range. For such fabrics and exposure scenarios, ISO/DIS 16602 requires the fabric to pass a qualitative, visual, test after flexing to determine whether the induced stress would affect the required integrity of the suit.

In this case, the flexed sample was placed in the chamber and evaluated visually by applying a slight pressure, covering the swatch with water, and observing for cracks as evidenced by the appearance of air bubbles. It should be obvious that a fabric sample that shows air leakage through cracks is not suitable for use. High performing materials such as Fabrics B, C, and D as well as embodiments shown as Fabrics E & F are evaluated quantitatively according to a pressure drop test.

These flexed samples are placed in a pressure pot, which is placed under a prescribed negative pressure; failure is noted as a failure to maintain the negative pressure.

- Class 6 >100,000 flex cycles
- Class 5 >40,000 flex cycles
- Class 4 >15,000 flex cycles
- Class 3 >5,000 flex cycles
- Class 2 >2,500 flex cycles
- Class 1 >1,000 flex cycles

To help understand the importance of this test, in column 1 of '947, Hauer discloses that "chemical protective garments must be durable in use [with respect to]...structural failure (e.g., to tearing, cracking or shrinking)." In column 3 of '947, Hauer further discloses that, "[t]he permeation resistance of the barrier film must not be degraded by flexing."

Flex cracking is one of the most commonly known and limiting failure modes of limited-use chemical protective fabrics. Flex cracking in film-based high chemical barrier composite fabrics is most evident in the areas seeing high degrees of flexing such as behind the knees and inside the elbow area on a garment. The ionomer (i.e., Surlyn®) top-coated PET fabric described by Hauer fails to address this common failure mode as shown below in the ISO 7854 flex test results.

- Fabric "A" - flex failure <1,000 cycles
- Fabric "B" - flex failure <1,000 cycles
- Fabric "C" - flex failure <5,000 cycles
- Fabric "D" - flex failure 50,000-70,000 cycles
- Fabric "E" - flex failure >40,000 cycles
- Fabric "F" - flex failure >480,000 cycles

Even without the improvement of the TPO coating demonstrated by the subject patent, other non-ionomer based chemical barriers such as

Fabrics C and D show improved flex crack resistance over those embodied by Hauer (i.e., Fabrics A & B).

A fabric exhibiting a flex crack resistance <1,000 cycles is of little use in a chemical protective garment especially in high exposure scenarios such as is common in emergency response. The true significance of the subject patent is that the field durability of most limited-use chemical protective fabrics can be improved with the addition of a layer of TPO. The improvement claimed by Hauer is questionable given the results included herein.

Fabric E is an embodiment (embodiment #1) of the subject patent using Fabric C as a receptive substrate; similarly, Fabric F is an embodiment (embodiment #4) of the present invention using Fabric F as a substrate.

Fabric E of the present invention shows an 8 fold improvement in flex crack over its un-coated equivalent, and Fabric F of the present invention shows an almost 10 fold improvement.

The use of TPO as a durability enhancement to limited-use chemical protective garments was neither disclosed nor anticipated by Hauer.

Furthermore, enablement of the TPO enhancement is described in great detail within the body of the Carroll application, which includes

specifics on process equipment, process temperature, extrusion screw configuration, etc.

6. As stated above, Fabric E shows an 8 fold improvement in flex crack over its un-coated equivalent, and Fabric F shows an almost 10 fold improvement. One of ordinary skill in the art would consider this result superior and unexpected.

7. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further the statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Todd R. Carroll

8-22-01

Date